CLAIMS

1. Method for real-time navigation using three-carrier radio signals of first, second and third different frequencies that increase in value from said first to said third frequency, to determine the position of a user, called a rover, said radio signals being transmitted by a given number of transmitters installed aboard satellites orbiting around the earth and in view of said rover, said signals being received by a receiver associated with said rover and a receiver associated with at least one ground station among a plurality of fixed ground stations called reference stations, said radio signals passing through a so-called ionospheric layer of the atmosphere surrounding said earth and experiencing disturbances that generate phase ambiguities in said carriers, characterized in that it comprises at least the following steps:

- a first step consisting in the determination, in said rover (*SUR*), of the so-called "extra-wide lane" ambiguity of the phase differences between said third and second carriers, from a combination of pseudoranges using a single code value;
- a second step consisting in the estimation, in said rover (*SUR*), of the so-called "wide lane" ambiguity of the phase differences between said first and second carriers, from said "extra-wide lane" ambiguity determined during said first step;
- a third step consisting, in said rover (*SUR*), in the resolution of the ambiguity of one of said frequencies, from said "wide lane" ambiguity estimated during said second step; and
- an additional step for applying real-time ionospheric corrections during said third step, said ionospheric corrections being based on a continuously updated real-time ionospheric model of said ionspheric layer (C_{ION}).

2. Method according to claim 1, characterized in that during said third step, said ambiguity resolution is performed on said first carrier frequency.

3. Method according to either of claims 1 and 2, characterized in that said model is a descriptive ionospheric model of said ionospheric layer, determined by at least one of said ground reference stations (*REF*) receiving signals transmitted by a predetermined number of said satellites (SAT_1-GPS_{E1} through SAT_n-GPS_{En}) orbiting around the earth (*GT*) and in view of the latter, said signals comprising at least two carriers of different frequencies, in that said

model is determined from phase data from said transmitted signals, and in that it comprises a step for transmitting data corresponding to said ionospheric model.

4. Method according to claim 3, characterized in that said ionospheric model determination is obtained from the estimate of the free electron distribution in said ionospheric layer (C_{ION}), in that this estimation being performed approximately by breaking down the ionospheric layer (C_{ION}) into a grid of resolution volume units (Vox_{ijk}) called "voxels," illuminated by the radio radiation of said signals propagating in said ionospheric layer (C_{ION}), in which the ionospheric electron density distribution is presumed to be constant at a given moment, and in that said determination is obtained through real-time resolution of the average electron density in each of said volume units (Vox_{ijk}) illuminated by said radio radiation using a so-called Kalman filter.

5. Method according to claim 4, characterized in that it includes an additional step consisting of combining data associated with said ionospheric model with geodetic data calculated simultaneously, and in that said geodetic data are calculated by only one of said fixed ground reference stations (REF_M-REF_{ME}), called a master station, and distributed to said plurality of fixed ground reference stations (*REF*).

6. Method according to claim 1, characterized in that it includes an additional step consisting of using three pseudorange codes, associated with said three carriers, during said first step for determining the so-called "extra-wide lane" ambiguity of the phase differences between said third and second carriers.

7. Method according to claim 2, characterized in that it includes an additional step consisting of performing an integrity test using pseudorange and "wide lane" codes and a code of said second frequency to detect jumps associated with an error in said ambiguity resolution of said first frequency.

8. Satellite navigation system for implementing the method according to any of the preceding claims, characterized in that it comprises a plurality of satellites (SAT_I-GPS_{EI}

through SAT_n-GPS_{En}) orbiting around the earth (*GT*), each of the satellites transmitting said three-carrier signals of different frequencies, at least one rover (*SUR*) comprising a receiver (SUR_{GPS}) of said signals and integrated calculation means that perform said first through third steps and integrate said ionospheric corrections derived from a descriptive ionospheric model of a region of the ionosphere passed through by the radio radiation of said signals transmitted by said plurality of satellites (SAT_1-GPS_{E1} through SAT_n-GPS_{En}), a plurality of fixed ground stations, called reference stations (*REF*), each comprising a receiver (REF_{GPS}) receiving said signals transmitted by said satellites, integrated calculation means for the determination of said descriptive ionospheric model of the ionospheric layer (C_{ION}), and a transmitter (REF_E) for transmitting data corresponding to said ionospheric model to said receiver (SUR_{GPS}) of a rover (*SUR*), and in that at least one of said fixed ground reference stations, called a master station (REF_M), comprises a receiver ($REFM_{GPS}$) of said signals transmitted by said plurality of satellites (SAT_1-GPS_{E1} through SAT_n-GPS_{En}), means for calculating geodetic data, and a transmitter (REF_{ME}) for distributing them to said plurality of fixed ground reference stations (*REF*).

9. System according to claim 8, characterized in that said rover (*SUR*) is located at a distance of more than 100 km from the nearest fixed ground reference station (*REF*).